Important Advances in Clinical Medicine

Epitomes of Progress—Occupational Medicine

The Scientific Board of the California Medical Association presents the following inventory of items of progress in occupational medicine. Each item, in the judgment of a panel of knowledgeable physicians, has recently become reasonably firmly established, both as to scientific fact and important clinical significance. The items are presented in simple epitome and an authoritative reference, both to the item itself and to the subject as a whole, is generally given for those who may be unfamiliar with a particular item. The purpose is to assist the busy practitioner, student, research worker or scholar to stay abreast of these items of progress in occupational medicine which have recently achieved a substantial degree of authoritative acceptance, whether in his own field of special interest or another.

The items of progress listed below were selected by the Advisory Panel to the Section on Occupational Medicine of the California Medical Association and the summaries were prepared under its direction.

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Skin Absorption of Toxic Materials

SOME 20 YEARS AGO the toxicologic literature posed the following question: Are chemicals that are applied to the skin likely to be absorbed? At that time it was assumed that the outermost layer of the epidermis, the stratum corneum, presented an almost impermeable barrier to most chemicals; absorption was believed to be the exception rather than the rule.

In the last ten years, however, the situation has reversed, largely because of improved analytic methods (the most convenient of which uses radioactively labeled compounds). It has become clear that the opposite is true. Most materials with small molecular weights can be absorbed by the skin. The question now is not *whether* but *how much* of a material will be absorbed, and what are the kinetics involved. It can be assumed that many, if not most, of the organic compounds routinely handled by people in industry and in cosmetics (such as skin care products, topical drugs and home care products) are absorbed percutaneously. Even substances with relatively high molecular weights, such as tuberculin protein, are absorbed sufficiently to allow a positive tuberculin test by epicutaneous application.

The clinical significance of this absorption may be overt or covert, depending on many factors in a patient's history and awareness on the part of the clinician. Two recent examples involved hexachloraphene, and phenolics used in laundering hospital linen. Ordinarily, hexachloraphene is not extensively absorbed by the skin. However, in cases in which it comes into contact with more permeable areas such as the face, is in continuous contact with the skin for an extended time (for example, due to its use with diapers) or has enhanced permeability due to abnormal skin conditions, significant levels may be detected in the blood and tissues. Thus, fatalities occurred as a result of high concentrations of hexachloraphene present in a baby powder formulation manufactured in France. Here in the United States an equally challenging epidemiologic problem arose. A careful investigation of deaths of infants in several hospital nurseries traced the cause to absorption of phenolics from crib linens.

We are only beginning to recognize and solve the problems within this important clinical area. Therefore, some practical guidelines for physicians in treating patients who may be suffering from absorption of toxic materials are needed. First, it is necessary to determine whether percutaneous penetration is a possible route of toxic exposure. Second, it is important to search the

literature and to ask the supplier of the material in question whether absorption studies using appropriate methods have been done. Using these lines of inquiry one may be able to determine the site and manner of entry.

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Asbestos-Related Diseases

BECAUSE OF EPIDEMIOLOGIC STUDIES on the pathological changes produced by inhalation of free asbestos fiber, it is now known that the primary diseases among asbestos workers are asbestosis and cancer. Although cancer may develop at different sites in these exposed persons, approximately 20 percent of all deaths are due to lung cancer. Some 6 percent to 7 percent result from pleural or peritoneal mesothelioma, or both, and an excess of deaths is found in several other categories of malignant disease, specifically cancer of the esophagus, stomach, colon-rectum, oropharynx, larynx and kidney. In a study of 17,800 asbestos insulation workers followed from January 1, 1967, to January 1, 1977, it was predicted statistically that 1,661 deaths would occur; however, 2,270 were observed. Of these, 994 deaths resulted from cancer, although only 320 had been expected. No cases of mesothelioma were anticipated because of the rarity of this tumor; however, in the group studied, there were 175. Asbestosis, without malignant change, accounted for 162 deaths.

Mesotheliomas, even though rare, were also encountered among family contacts of asbestos workers residing in the same households, in addition to persons living within a quarter mile or so of facilities where asbestos-containing materials were used. It is important to note that while mesothelioma is not necessarily the most common disease following asbestos exposure, it provides an extremely useful index because it is not known to be found in relation to other types of exposure.

There is a 15- to 35-year lag period between initial contact with asbestos and clinical evidence of involvement. Radiographic changes may appear earlier, although in workers with 5 to 15 years of exposure, there are usually no symptoms and no disability, even with the changes visible by x-ray study. Typical of the disease is the increase in abnormal findings in direct relationship to length of exposure after initial contact. Further, early studies in shipyards indicated that members of other crafts such as boilermaking, shipfitting, welding, and the like also showed symptoms of mesotheliomatous disease. During World War II approximately 4.5 million men and women were employed in shipyards in the United States, and since then, the number has fluctuated between 200,000 and 250,000. Because of the turnover, the actual number of persons exposed is larger. Of interest is the finding that just one month of employment has led to increased risk of death from cancer.

Subsequent studies of shipyard personnel elsewhere have substantiated earlier findings. At one site, approximately half of the workers examined showed radiographic evidence of pulmonary and pleural changes usually seen following direct or indirect exposure to asbestos. Among persons with longer work experience there was a higher incidence of pleural asbestosis and parenchymal disease. The nature of shipyard work exposes all types of personnel to asbestos during installation, repair or removal of asbestos-containing materials. The extent of risk, that is, the number of neoplasms that will occur in the future among workers in whom there is evidence already of asbestotic changes, is not known.

The following procedures are recommended: (1) Make workers and managerial personnel aware of the disease potential of past and future exposure to asbestos; (2) avoid additional exposure through appropriate industrial engineering and industrial hygiene controls; (3) institute prompt therapy for respiratory infections that occur in asbestotic patients; (4) diagnose as early as possible cases of lung cancer in worker-patients manifesting radiographic changes and having a history of cigarette smoking; (5) exert every effort to have those exposed to asbestos stop smoking—not only to avert pulmonary carcinoma, but to diminish serious pulmonary disabilities associated with fibrosis of the lung, and to lessen the chance of the development of esophageal malignancy, and finally (6) through education, prevent workers from contaminating their homes with asbestos-soiled work clothing or tools.

The National Cancer Institute has mounted a strong educational campaign for the medical profession, workers and the lay public. Many ma-